

What is claimed:

1. An electrosurgical generator having a virtual control panel for controlling functionality of the electrosurgical generator in response to interrogation of an object interacting with a control panel image, the virtual control panel comprising:
  - 5 a display surface structure having a display surface upon which the control panel image is located;
  - a sensor positioned relative to the display surface structure to interrogate an interaction of the object with the control panel image at a location on the display surface separated from the sensor and to supply an interaction signal
  - 10 indicative of interaction of the object with the control panel image; and the electrosurgical generator comprises:
    - a generator controller operative to control functionality of the electrosurgical generator, the generator controller receiving the interaction signal and controlling functionality of the electrosurgical generator in response to the
    - 15 interaction signal.
2. An electrosurgical generator as defined in claim 1, wherein:
  - the sensor optically interrogates interaction of the object with the control panel image.
3. An electrosurgical generator as defined in claim 1, wherein the virtual control panel further comprises:
  - a projector positioned relative to the display surface structure to project optically the control panel image on the display surface.
4. An electrosurgical generator as defined in claim 1, wherein:
  - the control panel image is printed and attached to the display surface.
5. An electrosurgical generator as defined in claim 1, wherein:
  - the electrosurgical generator includes an exterior housing; and
  - the display surface structure is a portion of the housing.
6. An electrosurgical generator as defined in claim 1, wherein:
  - the electrosurgical generator includes an exterior housing; and

- the display surface structure is separate from the housing.
7. An electrosurgical generator as defined in claim 6, wherein:  
the display surface structure is attachable to and detachable from the housing.
8. An electrosurgical generator as defined in claim 7, wherein the virtual control panel further comprises:  
a communication link operative between the virtual control panel and the electrosurgical generator to communicate the interaction signal from the virtual control panel to the generator controller.
- 5 9. An electrosurgical generator as defined in claim 8, wherein:  
the communication link is wireless.
10. An electrosurgical generator as defined in claim 9, wherein:  
the wireless communication link uses radio frequency electromagnetic waves to communicate the interaction signal from the virtual control panel to the generator controller.
11. An electrosurgical generator as defined in claim 1, wherein:  
the display surface structure is sterilizable.
12. An electrosurgical generator as defined in claim 11, wherein:  
the display surface structure is disposable.
13. An electrosurgical generator as defined in claim 1, wherein:  
the sensor is connected to the display surface structure; and  
the display surface structure and the sensor are sterilizable.
14. An electrosurgical generator as defined in claim 1, wherein the virtual control panel further comprises:  
a projector connected to the display surface structure to project optically the control panel image on the display surface; and wherein:  
5 the projector is sterilizable.
15. An electrosurgical generator as defined in claim 14, wherein:  
the display surface structure and the sensor and the projector are disposable.
16. An electrosurgical generator as defined in claim 1, wherein:

the control panel image includes a contact control area and a display area, the contact control area representing control functionality of the electrosurgical generator, the display area presenting information describing functionality of the electrosurgical generator; and  
the sensor interrogating interaction of the object only within the contact control area of the control panel image.

17. An electrosurgical generator as defined in claim 1, wherein the virtual control panel further comprises:

a projector positioned relative to the display surface structure to project optically a contact control area and a display area of the control panel image on the display surface, the projector further projecting optically the information describing functionality of the electrosurgical generator in the display area of the control panel image.

18. An electrosurgical generator as defined in claim 17, wherein:  
the projector is connected to the generator controller;  
the generator controller supplies information signals to the projector indicative of the information describing the functionality of the generator; and  
the projector responds to the information signals to project the information describing functionality of the electrosurgical generator in the display area of the control panel image.

19. An electrosurgical generator as defined in claim 17, wherein:  
the control panel image includes a plurality of different contact control areas each of which represents a different control function of the electrosurgical generator;  
the sensor optically interrogates interaction of the object with each of the different contact control areas and generates the interaction signal related to interaction of the object with each of the contact control areas; and  
the generator controller responds to the interaction signal to control different functionality of the electrosurgical generator corresponding to the control function interrogated by interaction of the object with the corresponding contact control area.

20. An electrosurgical generator as defined in claim 1, wherein:  
the control panel image includes a plurality of different contact control areas each of which represents a different control function of the electrosurgical generator;
- 5 the sensor interrogates interaction of the object with each of the different contact control areas and generates interaction signals related to interaction of the object with each of the contact control areas; and  
the generator controller responds to each of the different interaction signals to control different functionality of the electrosurgical generator  
10 corresponding to the control function interrogated by interaction of the object with the corresponding contact control area.
21. An electrosurgical generator as defined in claim 20, wherein:  
the sensor optically interrogates interaction of the object with the different contact control areas of the control panel image.
22. An electrosurgical generator as defined in claim 21, wherein:  
the sensor comprises a light source which scans a transmitted light beam over the contact control areas of the control panel image, and a light receptor sensor which receives a received light beam created by reflection of the  
5 transmitted light beam from the object; and the virtual control panel further comprises:  
a device controller connected to the light source and the light ,  
receptor sensor, the device controller operatively controlling the light source to scan the transmitted light beam over the contact control areas at a predetermined  
10 scanning angle at each instance of time, and the device controller operatively determining the interaction of the object with a contact control area based on the scanning angle and the received light beam.
23. An electrosurgical generator as defined in claim 22, wherein:  
the light source delivers pulses of light as the transmitted light beam;  
the received light beam is formed by pulses of light which are time shifted relative to the corresponding pulses of the transmitted light beam as a  
5 result of reflection of the transmitted light beam from the object; and

the device controller operatively determines an interaction position where the object interacts with a contact control area based on the time shifted of the corresponding pulses of the transmitted and received light beams in addition to the predetermined scanning angle.

24. An electrosurgical generator as defined in claim 23, wherein the virtual control panel further comprises:

5 a projector positioned relative to the display surface structure to project a projection light beam on the display surface to optically create the contact control areas and the display areas of the control panel image on the display surface; and wherein:

10 the device controller is operatively connected to the projector to coordinate the location where the projection light beam creates the contact control areas relative to the interaction position where the object interacts with the contact control areas of the control panel image.

25. An electrosurgical generator as defined in claim 1, further comprising:

a virtual pad in addition to the virtual control panel, the virtual pad including a pad display surface structure having a pad display surface;

5 a pad projector positioned relative to the pad display surface structure to project optically a pad control panel image on the pad display surface;

10 a pad sensor positioned relative to the pad display surface structure to interrogate an interaction of the object with the pad control panel image at a location on the pad display surface separated from the sensor and to supply a pad interaction signal indicative of interaction of the object with the pad control panel image; and wherein:

the generator controller is connected to receive the pad interaction signal and controls the functionality of the electrosurgical generator in response to the pad interaction signal in response to interaction of the object with the pad control image.

26. An electrosurgical generator as defined in claim 25, wherein:

the pad projector creates the pad control panel image with a pad contact control area and a pad display area, the pad contact control area

- representing control functionality of the electrosurgical generator, the pad display  
5 area presenting information describing functionality of the electrosurgical  
generator; and
- the pad projector projecting the information describing functionality of  
the electrosurgical generator in the pad display area of the pad control panel  
image.
27. An electrosurgical generator as defined in claim 26, wherein:  
the pad projector is connected to the generator controller;  
the generator controller supplies information signals to the pad  
projector indicative of the information describing the functionality of the generator;  
5 and
- the pad projector responds to the information signals to project the  
information describing functionality of the electrosurgical generator in the pad  
display area of the pad control panel image.
28. An electrosurgical generator as defined in claim 27, wherein the  
virtual pad further comprises:  
a communication link connecting virtual pad and the generator  
controller and operative to communicate the interaction signal and the information  
5 signals between the virtual pad and the generator controller.
29. An electrosurgical generator as defined in claim 28, wherein:  
the communication link is wireless.
30. An electrosurgical generator as defined in claim 1, further comprising:  
a virtual pad in addition to the virtual control panel, the virtual pad  
including a pad display surface structure having a pad display surface;  
a pad projector connected to the generator controller and positioned  
5 relative to the pad display surface structure to project optically a pad control panel  
image on the pad display surface; and wherein:  
the generator controller supplies information signals to the pad  
projector indicative of the information describing the functionality of the generator;  
and

10                   the pad projector responds to the information signals to project the  
information describing functionality of the electrosurgical generator as a part of the  
pad control panel image.

31.    An electrosurgical generator as defined in claim 30, wherein the  
virtual pad further comprises:

5                   a wireless communication link connecting the virtual pad and the  
generator controller and operative to communicate the interaction signal and the  
information signals between the virtual pad and the generator controller.

32.    An electrosurgical generator as defined in claim 30, wherein the  
virtual pad further comprises:

5                   a hood connected to the pad display surface structure and extending  
above the pad display surface for shielding the pad control panel image from  
ambient light.

33.    An electrosurgical generator as defined in claim 30, wherein the  
virtual pad further comprises:

5                   a base piece connected to the pad display surface structure base to  
support the virtual pad and orient the pad display surface structure at an angle  
relative to a horizontal reference; and

                  a self-contained power supply connected to one of either the base  
piece or the pad display surface structure for supplying power to the pad projector.

34.    A virtual control panel for controlling functionality of an electrosurgical  
generator in response to interrogation of an object interacting with virtual control  
panel, the electrosurgical generator including a generator controller operative to  
control the functionality of the electrosurgical generator in response to control input  
5 signals, the virtual control panel comprising:

                  a display surface structure having a display surface;  
                  a control panel image on the pad display surface; and  
                  a sensor positioned relative to the display surface structure to  
interrogate an interaction of the object with the control panel image at a location on  
10 the display surface separated from the sensor, the sensor creating an interaction  
signal indicative of interaction of the object with the control panel image, the sensor

supplying the interaction signal as a control input signal to the generator controller by which to cause the generator controller to control the functionality of the electrosurgical generator in response to the interaction of the object with the control panel image.

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35. A virtual control panel as defined in claim 34, wherein:  
the sensor optically interrogates interaction of the object with the control panel image.

36. A virtual control panel as defined in claim 34, wherein:  
the control panel image is printed and attached to the display surface.

37. A virtual control panel as defined in claim 34, further comprising:  
a projector positioned relative to the display surface structure to project optically the control panel image on the display surface.

38. A virtual control panel as defined in claim 37, wherein:  
the control panel image projected by the projector includes a contact control area and a display area, the contact control area representing control functionality of the electrosurgical generator, and the display area presenting information describing functionality of the electrosurgical generator;

5

the sensor interrogating interaction of the object within the contact control area of the control panel image;

the projector projecting information describing functionality of the electrosurgical generator in the display area of the control panel image; and

10

the projector projecting the information describing the functionality of the electrosurgical generator in response to information signals supplied by the generator controller.

39. A virtual control panel as defined in claim 38, further comprising:  
a transmitter receiver connected to the projector and sensor to communicate wirelessly the interaction and information signals to and from the generator controller.

40. A virtual control panel for displaying functionality of an electrosurgical generator at a position remote from the electrosurgical generator, the



electrosurgical generator including a generator controller operative to control the functionality of the electrosurgical generator and which supplies information signals indicative of the functionality of the electrosurgical generator, the virtual control panel comprising:

a display surface structure having a display surface;  
a control panel image on the pad display surface; and  
a projector positioned relative to the display surface structure to project optically the control panel image on the display surface, the projector operatively connected to receive information signals from the generator controller, the projector projecting the information describing the functionality of the electrosurgical generator as a part of the control panel image in response to the information signals.

41. A virtual control panel as defined in claim 40, further comprising:  
a transmitter receiver connected to the projector to communicate wirelessly the information signals from the generator controller to the projector.

42. A method for controlling functionality of an electrosurgical generator, comprising:

presenting a control panel image on a display surface of a display surface structure;

including within the control panel image a contact control area which represents a function of the electrosurgical generator;

interacting an object with the contact control area as a designation of selected functionality to be performed by the electrosurgical generator;

optically interrogating the contact control area for interaction by the object; and

controlling the functionality of the generator in response to interrogating the interaction of the object with the contact control area.

43. A method as defined in claim 42, further comprising:  
presenting the control panel image by optically projecting the control panel image onto the display surface.

44. A method as defined in claim 42, further comprising:

presenting the control panel image by attaching a printed representation of the control panel image attached to the display surface.

45. A method as defined in claim 42, further comprising:  
using a finger of an operator of the electrosurgical generator as the object for interacting with the control panel image.

46. A method as defined in claim 42, further comprising:  
positioning the display surface structure and the display surface within a sterile field at a surgical site.

47. A method as defined in claim 42, further comprising:  
physically separating the display surface structure and the display surface from the electrosurgical generator.

48. A method as defined in claim 42, wherein the electrosurgical generator includes an exterior housing, and the method further comprises:  
using the exterior housing of the electrosurgical generator as the display surface structure and a portion of the exterior housing of the electrosurgical generator as the display surface; and

5 presenting the control panel image by optically projecting the control panel image onto the portion of the housing forming a display surface.

49. A method as defined in claim 42, wherein the electrosurgical generator includes an exterior housing, and the method further comprises:  
separating the display surface structure from the housing.

50. A method as defined in claim 49, further comprising:  
attaching the display surface structure to the housing; and  
detaching the display surface structure from the housing.

51. A method as defined in claim 42, further comprising:  
sterilizing the display surface structure prior to controlling the functionality of the electrosurgical generator.

52. A method as defined in claim 51, further comprising:  
disposing of the display surface structure after controlling the functionality of the electrosurgical generator.

53. A method as defined in claim 51, further comprising:

- using a sensor connected relative to the display surface structure to optically interrogate the contact control area for interaction by the object; and sterilizing the sensor prior to controlling the functionality of the
- 5 electrosurgical generator.
54. A method as defined in claim 53, further comprising:  
disposing of the display surface structure and the sensor after controlling the functionality of the electrosurgical generator.
55. A method as defined in claim 53, further comprising:  
using a projector connected relative to the display surface structure to present the control panel image by optically projecting the control panel image onto the display surface; and
- 5 sterilizing the projector prior to controlling the functionality of the electrosurgical generator.
56. A method as defined in claim 55, further comprising:  
disposing of the display surface structure and the sensor and the projector after controlling the functionality of the electrosurgical generator.
57. A method as defined in claim 42, further comprising:  
including a contact control area and a display area in the presented control panel image;  
permitting control over the functionality of the electrosurgical
- 5 generator by interacting the object only with the contact control area; and  
presenting information describing functionality of the electrosurgical generator in the display area.
58. A method as defined in claim 57, further comprising:  
supplying information signals from the generator controller to the virtual control panel as the basis for the information describing the functionality of the generator;
- 5 supplying interaction signals to the generator controller from the virtual control panel as the basis for controlling the functionality of the generator;  
and

wirelessly communicating the interaction and information signals between the electrosurgical generator and the virtual control panel.

59. A method as defined in claim 57, further comprising:

including in the control panel image a plurality of different contact control areas each of which represents a different control function of the electrosurgical generator;

5 optically interrogating interaction of the object with each of the different contact control areas;

controlling different functionality of the electrosurgical generator corresponding to the control function interrogated by interaction of the object with the corresponding contact control area.

60. A method as defined in claim 42, further comprising:

including in the control panel image a plurality of different contact control areas each of which represents a different control function of the electrosurgical generator;

5 optically interrogating interaction of the object with each of the different contact control areas;

controlling different functionality of the electrosurgical generator corresponding to the control function interrogated by interaction of the object with the corresponding contact control area.

61. A method as defined in claim 42, further comprising:

presenting the control panel image by optically projecting the control panel image onto the display surface;

5 including in the projected control panel image a plurality of different contact control areas each of which represents a different control function of the electrosurgical generator;

10 optically interrogating the contact control area for interaction by the object by scanning a transmitted light beam over the contact control areas of the control panel image, and by receiving a received light beam created by reflection of the transmitted light beam from the object;

controlling a predetermined scanning angle of the transmitted light beam over the contact control areas at each instance of time; and

interrogating the interaction of the object with a contact control area based on the scanning angle and the received light beam.

62. A method as defined in claim 61, further comprising:

delivering pulses of light as the transmitted light beam;

forming the received light beam by pulses of light which are time shifted relative to the corresponding pulses of the transmitted light beam as a

5 result of reflection of the transmitted light beam from the object; and

determining an interaction position where the object interacts with a contact control area based on the time shifted of the corresponding pulses of the transmitted and received light beams in addition to the predetermined scanning angle.

63. A method as defined in claim 62, further comprising:

projecting a projection light beam on the display surface to optically create the contact control areas and the display areas of the control panel image on the display surface; and

5 coordinating the location where the projection light beam creates the contact control areas relative to the interaction position where the object interacts with the contact control areas of the control panel image.

64. A method as defined in claim 42, further involving the use of a virtual pad in addition to the virtual control panel, the method further comprising:

optically projecting a pad control panel image on a pad display surface of a pad display surface structure of the virtual pad;

5 including within the pad control panel image a pad contact control area which represents a function of the electrosurgical generator;

interacting an object with the pad contact control area as a designation of selected functionality to be performed by the electrosurgical generator;

10 optically interrogating the pad contact control area for interaction by the object; and

- controlling the functionality of the generator in response to  
interrogating the interaction of the object with the pad contact control area and in  
response to interrogating the interaction of the object with the contact control area  
15 of the virtual control panel.
65. A method as defined in claim 42, further comprising:  
shielding the control panel image from being washed out by ambient  
light.
66. A method for controlling functionality of an electrosurgical generator,  
comprising:  
presenting a plurality of control panel images on display surfaces of a  
corresponding plurality of display surface structures;  
5 including within at least one control panel image a contact control  
area which represents a function of the electrosurgical generator;  
including within at least one other control panel image a display area  
which presents information describing the functionality of the electrosurgical  
generator;  
10 interacting an object with one contact control area as a designation of  
selected functionality to be performed by the electrosurgical generator;  
optically interrogating the one contact control area for interaction by  
the object;  
controlling the functionality of the generator in response to  
15 interrogating the interaction of the object with the one contact control area which  
designates the selected functionality; and  
presenting information describing the functionality of the generator in  
the display area of the one other control panel image.
67. A method of displaying functionality of an electrosurgical generator at  
a position remote from the electrosurgical generator, the electrosurgical generator  
including a generator controller operative to control the functionality of the  
electrosurgical generator and to supply information signals indicative of the  
5 functionality of the electrosurgical generator, the method comprising:

presenting a control panel image on a display surface of a display surface structure at a position separated from the electrosurgical generator;  
optically projecting the control panel image on the display surface;

and

10                   projecting information describing the functionality of the electrosurgical generator as a part of the control panel image in response to the information signals.

68.   A method as defined in claim 67, further comprising:

                  wirelessly communicating the information signals from the generator controller to be used in projecting the information describing the functionality of the electrosurgical generator as a part of the control panel image.